

LBYCV3B – Construction Materials and Testing Laboratory

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Experiment No. 6 (Specific Gravity of Cement)

I. Introduction

The specific gravity of cement, being used as proportioning a mixture, is the ratio between the weight of a given volume of cement and the weight of an equal volume of water. For portland cements, its specific gravity is 3.15.

The following are the objectives of this experiment:

- To determine the specific gravity of portland cement;
- To compare the theoretical specific gravity to the actual specific gravity of portland cement; and
- To indicate the importance of the specific gravity of cement, more specifically in the engineering field.

II. Procedure

The following steps are conducted in the experiment:

- The Le Chatelier's flask was filled with kerosene until the mark of 1 cubic centimeter (cc) would be exceeded a little bit so that the reading that would take place in the later part of the experiment would be in between the mark of 0 cc to 1 cc.
- To ensure that there would be no remnants of kerosene in the walls of the neck of the flask that would clog the cement, a clean absorbent cloth would be used to dry the inside neck.
- Placing the stopper to prevent any spillage and immersing the flask in a water bath that has a constant temperature of 20 ± 0.1 °C and not less than 40 minutes to ensure that the volume is stabilized. Only when there would be three identical readings at an interval of two minutes for the volume, does the volume is considered as stabilized.

- Determine the initial volume of the kerosene by reading the lower meniscus on the flask, of which the initial volume would be considered as the initial reading.
- Using a digital weighing scale, collect approximately 64 grams of cement sample that would transfer into the flask by increments. While putting the cement sample in the flask, vibrating the flask should be accomplished to ensure that all cement samples would fall under the kerosene level and none would adhere to the flask.
- To remove any air bubbles trapped within the cement, rolling, vibrating and agitating the flask was done. This step was repeated multiple times until no air bubbles rise to the surface of the kerosene level.
- The flask with the cement was then once more immersed in a water bath with a constant temperature of 20 ± 0.1 °C and not less than 40 minutes. After three identical readings had been achieved, the flask was then removed from the bath.
- Determine the final volume of the kerosene, which would act the final reading that should be in the range of 18 to 24 cc.
- The process is then repeated two more times to get an average result for the specific gravity of the cement.

III. Data

Table 1: Data Sheet for Specific Gravity of Cement

Test No.	1	2	3
1. Flask No.	1	2	3
2. Weight of Cement Sample, g	64	64	64
3. Initial Volume of Kerosene, ml	0.3	0.7	0.9
4. Temperature at Initial Reading, °C	20	20	20
5. Final Volume of Kerosene, ml	20.7	21.2	21.2
6. Temperature at Final Reading, °C	20	20	20
7. Specific Gravity = $[2] / \{[5] - [3]\}$, g/cc	3.14	3.12	3.15
8. Average Specific Gravity, g/cc	3.14		

Calculations:

- R_f = Final Reading of Kerosene Level (cc)
- R_i = Initial Reading of Kerosene Level (cc)

- $W_c = \text{Weight of cement sample in Air (g)}$

Specific Gravity, SG

$$SG = \frac{W_c}{(Rf - Ri)}$$

Specific Gravity:

Flask No. 1: $64 / \{20.7 - 0.3\} = 3.14 \text{ g/cc}$

Flask No. 2: $64 / \{21.2 - 0.7\} = 3.12 \text{ g/cc}$

Flask No. 3: $64 / \{21.2 - 0.9\} = 3.15 \text{ g/cc}$

Average Specific Gravity:

$(3.14 + 3.12 + 3.15) / 3 = 3.14 \text{ g/cc}$

IV. Conclusions

Based on Table 1, the computed specific gravity of the cement samples are 3.14, 3.12, and 3.15 g/cc and the average of the three computed data is 3.14 g/cc. The resulting specific gravity is almost similar to the standard specific gravity of cement, which is 3.15 g/cc (PCA, 1988). Having a difference or discrepancy of 0.01 or 0.32% error could be resulted from human errors such as a partial wiping of the flask, a misread of the initial, and final reading of the kerosene level or vice versa, or a present air bubble in the mixture. However, such minimal value when estimated is zero, thus it can be neglected and inferred the experiment was conducted successfully.

The importance of finding the specific gravity of the cement is that the specific gravity tells us how heavy the cement would be when we have a certain volume of cement. Another use of the specific gravity of cement would be in mix proportioning of the concrete. It's easy to take for granted the fact that we have a value for the specific gravity of Portland Cement but it should be noted that there must have been an engineer who conducted this experiment without knowing the specific gravity of Portland cement beforehand.

V. Things Learned from the Experiment

We learned that errors in doing this experiment are less excusable since the Portland cement has a fixed value. If we would be able to compromise by using more difficult equations, it might have been possible to simply take down the temperature and make adjustments due to expansion and contraction of the concrete. Yet, the notion of the aforementioned would remove the ease of calculations that would have existed in this experiment.

VI. References

Portland Cement Association (PCA). (1988). *Design and Control of Concrete Mixtures*. Portland Cement Association.

